R E M A R K S

Applicants appreciate the examiner's indication of allowability of claim 5 if re-written independently. By the above amendment, the substance of claim 5 has been incorporated into claim 4, and claim 5 has been cancelled. Therefore, claim 4 should now be allowable.

The application has been amended to include a claim of priority under 35 U.S.C. §120 as a continuation of co-pending applications 08/857,836 (filed May 16, 1997) and 08/872,729 (filed June 11, 1997). A substitute Page 1 of the specification and redline version thereof are submitted under 37 CFR §1.121 embodying the appropriate statement in the specification. Such claim of priority overcomes the §102(e) rejection based on the McEwan '724 patent.

Regarding any "obviousness-type" double patenting rejections asserted against claim 1 and 4 based on U.S. Pat. 6,026,125), and a similar rejection that may be made against amended versions of these, applicants hereby submit a terminal disclaimer.

Claims 1-3 stand rejected under 35 U.S.C. §102(b) as being anticipated by McEwan '600 patent (U.S. Pat. 5,521,600). To overcome the rejection, applicants amended claims 1-3 in a manner similar (but not identical) to amendments made in parent application 08/857,836. In particular, claim 1 was amended to recite a "switched impulse" generator and a waveform adapter in the form of a filter to define a center

frequency, similar to claim 1 of applicants' issued parent application (U.S. Pat. 6,026,125). Claims 2 and 3[1] were also amended to recite a switched impulse generator and waveform adapter. Patentability of claims embodying these elements over McEwan '600 was thoroughly established in the patent application SN 09/857,836 via an amendment filed May 17, 1999 (copy with attachments A-G are submitted herewith) where, as *reasons for allowance* (copy attached), the examiner stated, "none of the prior arts teaches or suggests … a transmitter … that comprises a switch impulse generator … and a waveform adapter." Similar reasons exist for allowance of the amended claims of the present application.

Even though obviated by applicants' priority claim, McEwan '724 (6,191,724) has shortcomings similar to the McEwan '600 patent, and also does not suggest or anticipate the newly amended claims.

Newly added claims 6-28 depend from one of independent claims 1-3. These should likewise be allowable for reasons stated above, but in addition, for reason that the McEwan references do not appear to suggest or disclose a tunnel *diode* (as recited by claims 6,14, and 21 (method)), an *amplifier* or *amplifying* interposed between the UWB source and the antenna (as recited by claims 7, 15, and 22 (method)), *bandpass filtering or pulse shaping* (as recited by claims 8, 16, and 23), an *attenuator* or *variably attenuating* an echo or received signal (as recited by claims 10-12, 17-19, 25, and 27-28), or *controlling the attenuator or variably attenuating* (as recited

[1] The form of method claim 3 has also be corrected.

by claims 12-13, 19-20, and 27-28). Patentability of the dependent claims stand on their own merit.

Reconsideration is respectfully requested.

Respectfully submitted,

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ULTRA-WIDEBAND RECEIVER AND TRANSMITTER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application combines the transmitter-receiver disclosures and is a continuation of commonly-owned U.S. patent applications Serial Nos. 08/857,836 and 08/872,729 filed May 16, 1997 and June 11, 1997, respectively, by the same inventors hereof (now U.S. Pats. 6,026,125 and 5,901,172, respectively). The subject matter of each of said applications is incorporated herein.

This application is also related to commonly-owned U.S. application Serial No. 09/118,919 filed July 20, 1998 (now U.S. Pat. 6,239,741), also incorporated herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of ultra-wideband communication systems. More particularly, it relates to the controlled transmission and reception of ultra-wideband electromagnetic pulses.

2. Background of Related Art

Ultra-wideband (UWB) systems, both for radar and communications applications, have historically utilized impulse, or shock-excited, transmitter techniques in which an ultra-short duration pulse (typically tens of picoseconds to a few nanoseconds in duration) is directly applied to an antenna which then radiates its characteristic impulse response. For this reason, UWB systems have often been referred to as "impulse" radar or communications. In addition, since the excitation pulse is not a modulated or filtered waveform, such systems have also been termed "carrier-free" in that no

Serial No. 09/251,297
Amended Claims - Redline Version

1. (Amended) A range measuring device comprising a waveform adaptive ultra-wideband transmitter <u>and receiver</u>, said [range measuring] device comprising:

a [signal] <u>switched impulse</u> generator to generate a <u>low-level</u> waveform adaptive ultra-wideband signal;

<u>a filter that filters said low-level ultra-wideband signal to define a center frequency thereof and to produce a filtered low-level ultra-wideband signal;</u>

an antenna responsive to said [signal generator] <u>filter</u> to radiate a signal representing said ultra-wideband signal; and

a receiver for receiving said radiated ultra-wideband signal.

2. (Amended) A communication system utilizing an ultra-wideband transmitter, said [ultra-wideband transmitter] <u>system</u> comprising:

a [signal] <u>switched impulse</u> generator <u>including one of an impulse-excited oscillator and a UWB impulse generator</u> to generate a <u>low-level</u> [waveform adaptive] ultra-wideband signal;

<u>a waveform adapter responsive to said impulse generator;</u>

an antenna responsive to said [signal generator] <u>waveform adapter</u> to radiate a representation of said ultra-wideband signal; and

a receiver for receiving said radiated ultra-wideband signal.

3. (Amended) A method for detecting an object utilizing ultra-wideband transmitting techniques, said method comprising:

[a signal generator to generate] generating a switched impulse, low-level [waveform adaptive] ultra-wideband signal;

waveform adapting said switched impulse, low-level ultra-wideband signal;

[an antenna responsive to said signal generator to radiate] radiating upon said object a signal representing said waveform-adapted, ultra-wideband signal; and

[a receiver for] receiving an echo of said radiated, waveform adapted, ultra-wideband signal thereby to detect said object.

4. (Amended) A waveform adaptive ultra-wideband transmitter comprising:

a signal generator to generate a series of discrete low-level ultra-wideband signals having a selectable carrier frequency;

a waveform adapter responsive to said low-level ultra-wideband signals and including at least one of a bandpass filter, a mixer, a pulse shaper, and an attenuator that controls one of frequency, pulse shape, bandwidth, phase, multi-level amplitude, and multi-level attenuation of said low-level ultra-wideband signals, said waveform

adapter controlling said low-level ultra-wideband signal on a dynamic, real-time basis; and

an antenna responsive to said waveform adapter to radiate ultra-wideband signals.

5. (Cancelled)

Claims 6-13 Depending From Amended Claim 1

6. (New) The range measuring device as recited in claim 1, wherein said receiver comprises at least one tunnel diode responsive to an echo pulse.

7. (New) The range measuring device as recited in claim 1, further comprising an amplifier that amplifies said ultra-wideband signal.

8. (New) The range measuring device of claim 7, wherein said filter comprises one of a band-pass filter and a pulse shaper.

9. (New) The range measuring device of claim 8, wherein said filter defines a bandwidth of the signal radiated by the antenna.

10. (New) The range measuring device of claim 1, wherein the receiver includes:

a variable attenuator coupled to a receiving antenna; and

a detector to detect an output of said variable attenuator.

11. (New) The range measuring device of claim 10, wherein said detector comprises a tunnel diode.

12. (New) The range measuring device of claim 10, further including a controller that controls the variable attenuator to enable the detector to discriminate between noise and range measuring signals.

13. (New) The range measuring device of claim 12, wherein said controller utilizes a bit error rate to discriminate between noise and range measuring signals.

Claims 14-20 Depending From Amended Claim 2

14. (New) The communication system as recited in claim 2, wherein said receiver comprises a tunnel diode to detect said ultra-wideband signals.

15. (New) The communication system as recited in claim 2, further comprising an amplifier interposed between said waveform adapter and antenna to amplify said ultra-wideband signal.

16. (New) The communication system as recited in claim 15, wherein said waveform adapter comprises one of a band-pass filter and a pulse shaper.

17. (New) The communication system as recited in claim 2, wherein the receiver includes:

a variable attenuator coupled to a receiving antenna; and

a detector to detect an output of said variable attenuator.

18. (New) The communication system as recited in claim 17, wherein said detector comprises a tunnel diode.

19. (New) The communication system as recited in claim 17, further including a controller that controls the variable attenuator to enable the detector to discriminate between noise and information signals.

20. (New) The communication system as recited in claim 19, wherein said controller utilizes a bit error rate to discriminate between noise and information signals.

Claims 21-28 Depending From Amended Claim 3

21. (New) The method of claim 3, further comprising the step of providing a tunnel diode to receive the echo.

22. (New) The method of claim 3, further comprising, prior to said radiating step, amplifying said switched impulse, low-level ultra-wideband signal.

23. (New) The method of claim 22, wherein said waveform adapting comprise one of bandpass filtering and pulse shaping of said switched impulse, low-level ultra-wideband signal.

24. (New) The method of claim 23, further comprising the step of defining a bandwidth of the signal radiated upon the object.

25. (New) The method of claim 3, further comprising, in the receiving step:

variably attenuating the echo; and

detecting a signal produced by the echo after said variably attenuating.

26. (New) The method of claim 25, further including providing a tunnel diode to detect the echo.

27. (New) The method of claim 25, further including variably attenuating the echo to enable discrimination between noise and signals representing the echo.

28. (New) The method of claim 27, including utilizing bit error rate to discriminate between noise and signals representing the echo.